CLAIMS

What is claimed is:

1. A method of forming a semiconductor structure, comprising:

processing an oxide to have a crystalline arrangement; and

depositing an amorphous semiconductor layer on said oxide by one of evaporation and chemical vapor deposition (CVD).

2. The method according to claim 1, further comprising:

forming the oxide on silicon, said oxide being lattice-matched to said silicon.

3. The method according to claim 1, further comprising:

growing said oxide on a silicon substrate.

4. The method according to claim 1, wherein said amorphous semiconductor layer formed on said oxide forms a composite structure, said method further comprising:

heating the composite structure to a temperature above which the amorphous semiconductor layer converts to a single crystal epitaxial film, seeded by the underlying crystalline oxide,

the underlying crystalline oxide including any material which shares a surface symmetry element with the crystal structure of Si or Ge.

5. The method according to claim 1, wherein said semiconductor layer comprises Si.

6. The method according to claim 1, wherein said semiconductor layer comprises Ge.

7. The method of claim 1, wherein said semiconductor layer comprises a mixture of Si and Ge.

8. The method of claim 1, wherein said semiconductor layer comprises silicon, germanium, gallium arsenide, aluminum arsenide, indium phosphide, aluminum antimonide, indium arsenide, gallium phosphide and mixed alloys thereof.

9. The method of claim 1, further comprising:

in the oxide/amorphous semiconductor layer, performing amorphous to single crystal conversion in a presence of a vapor or a flux of a surfactant.

10. The method of claim 9, further comprising:

desorbing the surfactant by reduction with hydrogen.

11. The method of claim 9, wherein said surfactant includes Sb, As, Bi, P, B, N, Ga, Al, and In.

12. The method of claim 1, wherein said semiconductor layer comprises GaAs.

13. The method of claim 12, further comprising:

in the oxide/amorphous semiconductor layer, performing amorphous to single crystal conversion in a presence of a vapor of a surfactant.

14. The method of claim 13, wherein said surfactant includes one of Mg, Be, Si, C, Sb, As, and N.

15. A semiconductor structure, comprising:

a substrate;

a crystalline oxide layer formed over said substrate; and

an epitaxial silicon layer formed on said crystalline oxide layer.

16. The structure of claim 15, further comprising:

a silicon oxide layer formed between said substrate and said crystalline oxide layer.

17. The structure of claim 15, wherein the crystalline oxide layer comprises an oxide of at least one of the rare earth elements.

18. The structure of claim 15, wherein the crystalline oxide layer comprises an oxide of yttrium.

19. The structure of claim 15, wherein the crystalline oxide layer comprises a mixture of oxides of different rare earth elements and yttrium.

20. The structure of claim 15, further comprising at least one additional layer of crystalline oxide and at least one additional layer of silicon formed on said additional layer of crystalline oxide.

21. A semiconductor structure, comprising:

a substrate;

a crystalline oxide layer formed over said substrate; and

an epitaxial germanium layer formed on said crystalline oxide layer.

22. The structure of claim 21, further comprising:

a silicon oxide layer formed between said substrate and said crystalline oxide layer.

23. The structure of claim 21, wherein the crystalline oxide layer comprises an oxide of at least one of the rare earth elements.

24. The structure of claim 21, wherein the crystalline oxide layer comprises an oxide of yttrium.

25. The structure of claim 21, wherein the crystalline oxide layer comprises a mixture of oxides of different rare earth elements and yttrium.

26. The structure of claim 21, further comprising at least one additional layer of crystalline oxide and at least one additional layer of germanium formed on said additional layer of crystalline oxide.

27. A semiconductor structure, including:

a crystalline oxide surface; and

an amorphous layer of at least one of silicon, germanium, gallium arsenide, aluminum arsenide, indium phosphide, aluminum antimonide, indium arsenide, gallium phosphide and mixed alloys thereof, deposited on said crystalline oxide surface by evaporation or chemical vapor deposition.

28. A method of forming a semiconductor structure, including:

forming a crystalline oxide surface; and

depositing, on said crystalline oxide surface, an amorphous layer of at least one of silicon, germanium, gallium arsenide, aluminum arsenide, indium phosphide, aluminum antimonide, indium arsenide, gallium phosphide and mixed alloys thereof, said depositing being performed by one of evaporation and chemical vapor deposition (CVD).

29. The method according to claim 28, wherein said crystalline oxide surface is lattice-matched to the crystalline phase of the said amorphous layer.

30. The method according to claim 28, further comprising:

growing said crystalline oxide surface on one of a silicon substrate and a germanium substrate.

31. The method according to claim 28, wherein said amorphous layer formed on said crystalline oxide surface forms a composite structure, said crystalline oxide surface including a single crystal oxide layer, said method further comprising:

heating the composite structure to a temperature above which the amorphous layer converts to a single crystal epitaxial film, seeded by the single crystal oxide layer,

the crystalline oxide layer including any material which shares a surface symmetry element with the crystal structure of said amorphous layer.

32. The method according to claim 28, wherein said amorphous layer comprises Si.

33. The method according to claim 28, wherein said amorphous layer comprises Ge.

34. The method of claim 28, further comprising:

in the oxide/amorphous layer, performing amorphous-to-single crystal conversion in a presence of a vapor of a surfactant.

35. The method of claim 34, further comprising:

desorbing the surfactant by reduction with hydrogen.

36. The method of claim 34, wherein the surfactant comprises antimony.

37. The method of claim 34, wherein the surfactant consists of antimony.

38. The method of claim 34, wherein the surfactant comprises magnesium.

39. The method of claim 34, wherein the surfactant consists of magnesium.

40. A method of forming a semiconductor structure, comprising:

forming a crystalline oxide; and

epitaxially growing one of silicon, germanium, and a mixture of silicon and germanium on said oxide,

said epitaxially growing comprising:

cooling said oxide to a predetermined temperature; and

depositing said one of silicon, germanium, and a mixture of silicon and germanium on said oxide.

41. The method according to claim 40, wherein said one of silicon, germanium, and a mixture of silicon and germanium on said oxide, forms a composite structure, and wherein said epitaxially growing further comprises:

after said depositing, gradually heating said composite structure.

42. The method according to claim 41, wherein said gradually heating is performed in a presence of one of a vapor and a flux of a surfactant.

43. The method according to claim 42, wherein said surfactant includes at least one of As, Sb, Bi, P, B, N, Ga, Al, and In.

44. The method of claim 41, further comprising:

forming another layer of oxide over said one of silicon, germanium, and a mixture of silicon and germanium.

45. The method of claim 40, wherein said crystalline oxide comprises an epitaxial oxide film which is lattice-matched or near lattice-matched with an underlying silicon or germanium substrate.

46. The method of claim 45, wherein said crystalline oxide comprises a material from a bixbyite structural class.

47. The method of claim 45, wherein said crystalline oxide comprises a material from a calcium fluorite class.

48. The method of claim 45, wherein said crystalline oxide comprises a material from a pyrochlore structural class.

49. The method of claim 45, wherein said crystalline oxide comprises a material from a perovskite structural class.

50. The method of claim 45, wherein said crystalline oxide comprises a material from a perewskite structural class.

51. The method of claim 40, wherein the crystalline oxide possesses an epitaxial relation with an underlying substrate.

52. A method of forming a semiconductor structure, comprising:

cooling, to a predetermined temperature, an epitaxial oxide formed on a silicon structure; and

depositing a semiconductor on said oxide, said predetermined temperature being dependent upon a material of said semiconductor such that the deposited semiconductor assumes an amorphous microstructure.

53. The method of claim 52, further comprising:

after said depositing of said semiconductor, heating the structure to a temperature where the semiconductor starts crystallizing epitaxially, such that a seed for epitaxial crystallization is provided by the oxide,

wherein above a second predetermined temperature, which is higher than said first predetermined temperature, the amorphous semiconductor layer transforms to a single crystal epitaxial layer due to solid phase epitaxial growth seeded by the oxide.

54. The method of claim 53, further comprising:

annealing for solid phase epitaxy in a presence of a vapor or flux of a surfactant, thereby to form a monolayer or less of the surfactant covering the amorphous semiconductor surface, thereby to passivate the amorphous semiconductor surface and prevent it from roughening.

55. The method according to claim 1, further comprising:

forming the oxide on germanium, said oxide being lattice-matched to said germanium.

56. The structure of claim 15, wherein said substrate comprises a silicon substrate.

57. The structure of claim 15, wherein said substrate comprises a germanium substrate.

58. The structure of claim 21, wherein said substrate comprises a silicon substrate.

59. The structure of claim 21, wherein said substrate comprises a germanium substrate.